

ELECTRICAL TRANSMISSION

Description

The present invention relates to an electrical transmission having two generators which are coupled to the output shaft of an internal combustion engine via a step-up reduction gear operating as a transfer case.

In motor vehicles powered by an internal combustion engine the drive energy output by the internal combustion engine is initially transmitted to a differential transmission via a conventional automatic transmission and therefrom to the drive shaft.

In view of the increasingly strict emission regulations, it may become necessary for these vehicles, for example, city buses powered by internal combustion engines, to reduce harmful emissions.

15 A ~~An electrical transmission according to the definition of the species of Claim 1 is described in~~  
German Patent <sup>NO.</sup> 43 22 676 ~~C2~~. The known electrical transmission has two generators coupled to the output shaft of an internal combustion engine via a step-up reduction gear acting as a transfer case. The step-up reduction gear is designed as a belt reduction gear, and the internal combustion engine transmits its drive power via a differential transmission.

20 A Furthermore, U.S. Patent <sup>No. 1,710,345</sup> Application 17 10 345 A describes a motor vehicle in which two electrical traction motors are supplied with current from a generator referred to as a dynamo. Each traction motor is connected to a wheel to be driven via its own cardan shaft and its own differential.

25 A Summary of The Invention  
The object of the present invention is to provide an electrical transmission having a compact design which can be substituted, in a simple manner, for an existing automatic transmission

in vehicles powered by internal combustion engines.

This object is achieved according to the present invention through the features of Claim 1.  
One advantageous embodiment of the present invention is described in Claim 2.

5

10

The electrical transmission according to Claim 1 has two generators coupled to the output shaft of an internal combustion engine via a step-up reduction gear operating as a transfer case. The electrical transmission according to Claim 1 includes, according to the present invention, the following additional features:

10

- the generators are arranged next to one another;
- two electrical traction motors arranged next to one another are arranged underneath or behind the generators;
- a step-down reduction gear is arranged downstream from the electrical traction motors as a summator gear train;
- the step-up transmission is integrated in a connecting flange between the internal combustion engine and the generators and;
- the dimensions of the electrical transmission are adapted to those of an automatic transmission to be replaced.

15

20

The electrical transmission according to the present invention has a compact design and can be substituted for an existing automatic transmission in a simple manner.

25

The electrical transmission according to the present invention thus allows existing vehicles powered by an internal combustion engine, in particular city buses powered by a diesel mechanical drive, to be inexpensively retrofitted by replacing the existing automatic transmission with the electrical transmission.

30

By replacing the automatic transmission with the electrical transmission according to <sup>the present</sup> Claim 1, a city bus powered by a diesel electric drive is obtained in a simple manner. Compared to city buses powered by a diesel mechanical drive, such a city bus has a lower fuel consumption and considerably lower emission values, since the internal combustion engine can be operated in the optimum rpm range and its rpm is controlled continuously via the electrical traction motor. In conjunction with energy storage devices such as, for example, a

battery, fuel cell, or flywheel storage device, a low-emission or even an emission-free bus (hybrid bus) is obtained. The advantages of such hybrid vehicles are described, for example, in German <sup>publish</sup> Patent Application <sup>No.</sup> 41 33 013 A1.

Electrical transmissions according to the present invention may have a redundant power supply, since each generator can be activated via independent power electronics (rectifiers or converters). In addition, optimum adjustment to the required or desired drive power can be achieved in a simple manner. Furthermore, the individual generators can be driven with optimum efficiency by selectively turning at least one generator on or off.

In an embodiment according to ~~Claim 2~~ <sup>the present invention</sup>, the step-up reduction gear is designed as a gear transmission.

The invention is described in the following with reference to an embodiment schematically illustrated in the drawing.

Figure 1 shows a top view of an electrical transmission according to the present invention;

Figure 2 shows a bottom view an electrical transmission according to Figure 1.

Figures 1 and 2 show a first generator 1 and a second generator 2 which are coupled to a step-up reduction gear 5 via their generator shafts 3 and 4. Step-up reduction gear 5 is designed as a common transfer case and it is also coupled to a shaft 6 of an internal combustion engine 7.

The housings of generators 1 and 2 are connected to the housing of internal combustion engine 7 in a non-positive manner via a connecting flange 11.

According to the present invention, transfer case 5 is integrated in connecting flange 11.

The electrical energy generated by generators 1 and 2 is supplied to two electrical traction motors 8 and 9.

Both electrical traction motors 8 and 9 output the mechanical drive power generated via a

INSA37

As Figures 1 and 2 show, both electrical traction motors 8 and 9 are located below and behind generators 1 and 2.

1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217	
-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--